

WHAT IS CLAIMED IS:

1. A blast resistant assembly comprising:
a frame;
a composite panel having at least one glass sheet and at least one polymeric layer mounted in the frame; and
at least one retainer extending from the frame and at least partially embedded in the polymeric layer for securing the composite panel within the frame when a force is applied to the composite panel.
2. The blast resistant assembly of Claim 1, wherein the composite panel comprises a plurality of the glass sheets, and the at least one polymeric layer is located between the glass sheets.
3. The blast resistant assembly of Claim 1, wherein the at least one retainer comprises:
a base connected to the frame; and
an extension connected to the base, wherein the extension is at least partially embedded in the at least one polymeric layer.
4. The blast resistant assembly of Claim 3, wherein the base is an integral part of the frame.
5. The blast resistant assembly of Claim 3, wherein the base is a separate part installed in the frame.
6. The blast resistant assembly of Claim 3, wherein the extension comprises two opposed faces and each of the opposed faces contacts the at least one polymeric layer.
7. The blast resistant assembly of Claim 3, wherein the extension comprises two opposed faces and one of the opposed faces contacts the at least one polymeric layer.
8. The blast resistant assembly of Claim 3, wherein the extension comprises surface features for securing the extension within the at least one polymeric layer when a force is applied to the composite panel.

9. The blast resistant assembly of Claim 3, wherein the extension has a serrated surface.

10. The blast resistant assembly of Claim 3, wherein the extension comprises a first portion extending from the base and a second portion extending from the first portion in a direction substantially perpendicular to the first portion.

11. The blast resistant assembly of Claim 10, wherein the first portion and the second portion form an L shape.

12. The blast resistant assembly of Claim 10, wherein the first portion and the second portion form a T shape.

13. The blast resistant assembly of Claim 3, wherein the extension has at least one through hole.

14. The blast resistant assembly of Claim 13, wherein the at least one polymeric layer at least partially fills the at least one through hole.

15. The blast resistant assembly of Claim 3, wherein the base has a generally rectangular cross-section.

16. The blast resistant assembly of Claim 3, wherein the base has a generally square cross-section.

17. The blast resistant assembly of Claim 3, wherein the base has a generally round cross-section.

18. The blast resistant assembly of Claim 3, wherein the base comprises a longitudinal hole extending along a length of the base.

19. The blast resistant assembly of Claim 3, further comprising:
at least one longitudinal channel extending along a length of the base; and

at least one projection on the frame engaging the at least one longitudinal channel.

20. The blast resistant assembly of Claim 1, wherein the at least one retainer is slidably mounted to the frame.

21. The blast resistant assembly of Claim 1, wherein the at least one retainer is pivotally mounted to the frame.

22. The blast resistant assembly of Claim 1, wherein the at least one retainer is slidably and pivotally mounted to the frame.

23. The blast resistant assembly of Claim 1, wherein the composite panel is formed by applying heat and pressure to the at least one glass sheet and the at least one polymeric layer.

24. The blast resistant assembly of Claim 1, wherein the at least one polymeric layer is formed by injecting and curing a liquid polymer.

25. The blast resistant assembly of Claim 1, wherein the composite panel is formed by at least partially bonding the at least one retainer between two of the polymeric layers, which are bonded between two glass sheets.

26. The blast resistant assembly of Claim 25, wherein each of the polymeric layers contains a notch and the at least one retainer is at least partially bonded within the notches.

27. The blast resistant assembly of Claim 1, wherein the assembly comprises three of the polymeric layers, and the at least one retainer is located in a plane defined by one of the polymeric layers which is positioned between the other polymeric layers.

28. The blast resistant assembly of Claim 1, wherein the at least one retainer continuously surrounds the composite panel.

29. The blast resistant assembly of Claim 1, wherein the at least one retainer discontinuously surrounds the composite panel.

30. The blast resistant assembly of Claim 1, wherein the composite panel comprises a flat surface.

31. The blast resistant assembly of Claim 1, wherein the composite panel comprises a curved surface.

32. A retainer for securing a composite panel comprising a glass sheet and a polymeric layer within a frame when a force is applied to the composite panel, the retainer comprising:

a base structured and arranged for mounting in the frame; and
an extension extending from the base and structured and arranged for securing to the polymeric layer.

33. The retainer of Claim 32, wherein the extension comprises surface features for securing the extension within the polymeric layer when a force is applied to the composite panel.

34. The retainer of Claim 32, wherein the extension has substantially planar opposing faces.

35. The retainer of Claim 32, wherein the extension has a serrated surface.

36. The retainer of Claim 32, wherein the extension comprises a first portion extending from the base and a second portion extending from the first portion in a direction substantially perpendicular to the first portion.

37. The retainer of Claim 36, wherein the first portion and the second portion form an L shape.

38. The retainer of Claim 36, wherein the first portion and the second portion form a T shape.

39. The retainer of Claim 32, wherein the extension has at least one through hole.

40. The retainer of Claim 32, wherein the base has a generally rectangular cross-section.

41. The retainer of Claim 32, wherein the base has a generally square cross-section.

42. The retainer of Claim 32, wherein the base has a generally round cross-section.

43. The retainer of Claim 32, wherein the base comprises a longitudinal hole extending along a length of the base.

44. The retainer of Claim 32, further comprising:
at least one longitudinal channel extending along a length of the base structured and arranged for engagement with at least one projection on the frame.

45. The retainer of Claim 32, wherein the retainer is structured and arranged to be slidably mounted to the frame.

46. The retainer of Claim 32, wherein the retainer is structured and arranged to be pivotally mounted to the frame.

47. The retainer of Claim 32, wherein the retainer is structured and arranged to be slidably and pivotally mounted to the frame.

48. A blast resistant assembly comprising:
an outer frame;
an inner frame pivotally connected to the outer frame; and
a composite panel having at least one glass sheet and at least one polymeric layer, wherein the composite panel is mounted in the inner frame.

49. The blast resistant assembly of Claim 48, further comprising at least one retainer for securing the composite panel within the inner frame when a force is applied to the composite panel.

50. The blast resistant assembly of Claim 48, wherein the inner frame is pivotal between an open position and a closed position in relation to the outer frame.

51. The blast resistant assembly of Claim 48, wherein the inner frame is removable from the outer frame.

52. The blast resistant assembly of Claim 48, further comprising:
at least one hinge member positioned on the inner frame, wherein the at least one hinge member has a longitudinal hole;
at least one pin mounted within the longitudinal hole of the at least one hinge member, wherein the at least one pin is movable from a retracted position substantially inside the hinge member to an extended position substantially outside the hinge member; and

at least one hinge projection positioned on the outer frame and axially aligned with the at least one hinge member positioned on the inner frame, wherein the at least one hinge projection has a longitudinal hole for receiving the at least one pin when the pin is in the extended position.

53. The blast resistant assembly of Claim 52, wherein the inner frame further comprises a slidable bar for mounting the at least one pin.

54. The blast resistant assembly of Claim 53, wherein at least one handle is mounted to the slidable bar for moving the at least one pin from the retracted position to the extended position.

55. The blast resistant assembly of Claim 48, wherein the composite panel comprises a flat surface.

56. The blast resistant assembly of Claim 48, wherein the composite panel comprises a curved surface.

57. A blast resistant assembly comprising:
an outer frame;
an inner frame pivotally connected to the outer frame;
a composite panel having at least one glass sheet and at least one polymeric layer, wherein the composite panel is mounted in the inner frame; and
at least one retainer for securing the composite panel within the inner frame when a force is applied to the composite panel, wherein the at least one retainer comprises a base connected to the inner frame and an extension connected to the base and at least partially embedded in the at least one polymeric layer.

58. The blast resistant assembly of Claim 57, wherein the extension comprises surface features for securing the extension within the at least one polymeric layer when a force is applied to the composite panel.

59. The blast resistant assembly of Claim 57, wherein the extension has a serrated surface.

60. The blast resistant assembly of Claim 57, wherein the extension comprises a first portion extending from the base and a second portion extending from the first portion in a direction substantially perpendicular to the first portion.

61. The blast resistant assembly of Claim 60, wherein the first portion and the second portion form an L shape.

62. The blast resistant assembly of Claim 60, wherein the first portion and the second portion form a T shape.

63. The blast resistant assembly of Claim 57, wherein the extension has at least one through hole.

64. The blast resistant assembly of Claim 57, wherein the base has a generally rectangular cross-section.

65. The blast resistant assembly of Claim 57, wherein the base has a generally square cross-section.

66. The blast resistant assembly of Claim 57, wherein the base has a generally round cross-section.

67. The blast resistant assembly of Claim 57, wherein the base is slidably mounted to the inner frame.

68. The blast resistant assembly of Claim 57, wherein the base is pivotally mounted to the inner frame.

69. The blast resistant assembly of Claim 57, wherein the base is slidably and pivotally mounted to the inner frame.

70. The blast resistant assembly of Claim 57, wherein the inner frame is pivotal between an open position and a closed position in relation to the outer frame.

71. The blast resistant assembly of Claim 57, wherein the inner frame is removable from the outer frame.

72. The blast resistant assembly of Claim 57, further comprising:
at least one hinge member positioned on the inner frame, wherein the at least one hinge member has a longitudinal hole;
at least one pin mounted within the longitudinal hole of the at least one hinge member, wherein the at least one pin is movable from a retracted position substantially inside the hinge member to an extended position substantially outside the hinge member; and
at least one hinge projection positioned on the outer frame and axially aligned with the at least one hinge member positioned on the inner frame, wherein the at least one hinge projection has a longitudinal hole for receiving the at least one pin when the pin is in the extended position.

73. The blast resistant assembly of Claim 72, wherein the inner frame further comprises a slidable bar for mounting the at least one pin.

74. The blast resistant assembly of Claim 73, wherein at least one handle is mounted to the slidable bar for moving the at least one pin from the retracted position to the extended position.